

TITLE: Multicolor photometric observation of lightning from space: Comparison with radio measurements

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ABSTRACT BODY: This study evaluates the effectiveness of spectrophotometric measurements from space in revealing properties of lightning flash. The multicolor optical waveform data obtained by FORMOSAT-2/ISUAL were analyzed in relation to National Lightning Detection Network (NLDN), North Alabama Lightning Mapping Array (LMA). As of July 2011, we found six lightning events which were observed by ISUAL and North Alabama LMA. In two of these events, NLDN showed clear positive cloud-to-ground (CG) discharges with peak current of +139.9 kA and +41.6 kA and, around that time, LMA showed continuous intra-cloud (IC) leader activities at 4-6 km altitudes. ISUAL also observed consistent optical waveforms of the IC and CG components and, interestingly, it was found that the blue/red spectral ratio clearly decreased by a factor of 1.5-2.5 at the time of CG discharges. Other four lightning events in which NLDN did not detect any CG discharges were also investigated, but such a feature was not found in any of these cases. These results suggest that the optical color of CG component is more reddish than that of IC component and we explain this as a result of more effective Rayleigh scattering in blue light emissions coming from lower-altitude light source. This finding suggests that spectral measurements could be a new useful technique to characterize ICs and CGs from space. In this talk, we will also present a result from lightning statistical analysis of ISUAL spectrophotometric data and ULF magnetic data.
